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Improving the Enzi Interface

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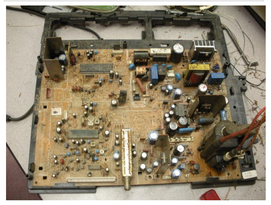
Waste to Watts
Energy Solutions

Abstract

Living in a country where frequent power outages can be extremely challenging. In many cases there is no generator to restore power during the outage because they are too expensive for developing countries to purchase.

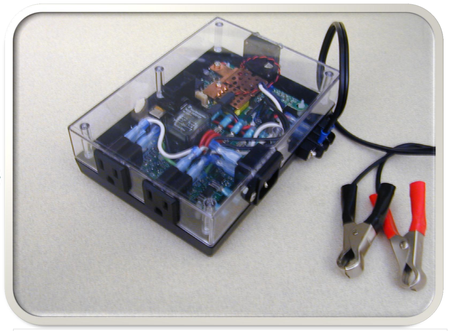
Now imagine a low cost uninterruptible power supply (UPS) that the people of these countries could afford. That is the purpose for the Enzi Interface developed by the company Waste To Watts (W2W). The purpose of this project is to aid W2W improving the Enzi.

Motherboard from an old television that we disassembled.



Power supplies, found at Metech Recycling, from computers. These are used in the Enzi.

E-waste (left) turns into the Enzi (right)



3rd Generation Enzi Prototype

1. Background

Waste to Watts is a company, based out of Atlanta, Georgia, that strives to combat energy poverty. They are developing a product that is called the Enzi Interface. The Enzi is a low cost high performance UPS that is made mostly from electronic waste, also known as e-waste. It does use some new parts like a lead-acid battery. The Enzi has the capability to run for hours and is not dependent on fossil fuels. The first Enzi products will be implemented in India, which has a high frequency of power outages and a large amount of e-waste. The power outages and large amounts of e-waste makes India a prime spot for the Enzi to make its debut.

Waste to Watts' Logo for the Enzi Interface

2. Goals/Objectives

- Researched used lead-acid batteries and the possibility of implementing a battery desulfator.
- Researched the possibility of integrating refurbished/recycled solar panels.
- Propose components of recycled e-waste for use in W2W follow-on product lines.
- Researched and analyzed common devices in the e-waste streams in India and the U.S.

3. Methods

Research On:
- Used batteries
- Desulfators
- Refurbished/recycled solar panels
- E-waste streams in India and U.S.
  - Most common devices in the streams
    - Components in the devices

Interviews/E-mail conversations with:
- Jim Dunn, Future Solar Systems LLC
- Jim Gardner, Metech Recycling
- Chris Hamman, Waste to Watts
- Creative Recycling Systems, e-waste recycler in the U.S.

We created:
- LED light kit. Served to identify simple electrical components and learn to solder.
- A dusulfator where we used e-waste for the making of it.

We disassembled an old cathode ray tube television and analyzed different electrical components.

Visited Metech Recycling in Worcester, an electronics recycling center. We were able to see how electronics were disassembled and what devices were most commonly recycled.

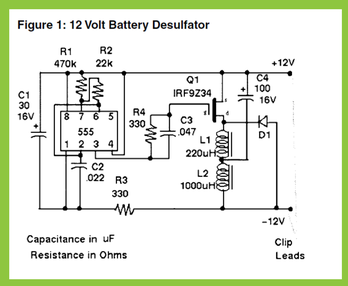
4. Results

- Used Batteries:
  - Car batteries discarded when capacity < 80% but are not actually dead.
- Desulfators:
  - Sulfation occurs on the plates of the batteries and causes poor function. Desulfators send pulses to the plates and rids the plates of the sulfates.
- Refurbished/Recycled Solar Panels:
  - First solar panels installed in the 1990s and ~25-35 years.
- E-waste Stream in India:
  - Generated: ~146,000 tons per year
  - Recycled: ~14,600 tons per year
- E-waste Stream in the U.S.:
  - Generated (2010): ~1.8 million tons
  - Recycled (2010): ~650,000 tons
- Most Common Devices in E-waste Streams:
  - Cathode Ray Tube (CRT) Televisions
  - Old Computer Monitors
  - Central Processing Units (CPU)
- Electrical Components in such Devices:
  - Copper Wire
  - Transistors
  - Resistors
  - Inductors
  - Diodes
  - Heat Sinks
  - Microprocessors
  - Capacitors
  - Jumper Wires
  - AV Input/Output
  - Potentiometers
  - Other Misc. Parts

5. Recommendations

•Invest in a Battery Load Tester to test old batteries and recondition the "good" old batteries.

•Integrate a desulfator. The desulfator (schematic) we found can be made for $20 brand new. Cost reduced by using e-waste.



Schematic for the production of the Desulfator described above.

•Wait about 15-20 years when availability of old solar panels is higher. Then try to integrate them into the Enzi.

•Form a partnership with an e-waste recycler to obtain components easier.

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